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## ARTICLE VII.

### REMARKS ON SAUROCEPHALUS AND ITS ALLIES.

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[Read November 21, 1856.]

THE genus *Saurocephalus* was founded by Dr. Harlan on a specimen consisting of the greater portion of the right upper maxillary bone with teeth of a sphyrænoid fish, discovered in a cavern on the Missouri River, and which probably belonged to the cretaceous period. The animal was supposed by Dr. Harlan to have been a saurian, and to the species he gave the name of *S. lanciformis*.

A second and much smaller species was subsequently described by Dr. Hays under the name of *Saurodon Leanus*, from a specimen consisting of the upper and lower jaws, obtained from the green sand of New Jersey, and now in the possession of Dr. Isaac Lea, who has kindly loaned it to me for inspection. Dr. Hays was aware that the animal indicated by this specimen belonged to the same genus as the species described by Dr. Harlan with the name of *Saurocephalus lanciformis*, but conceiving the generic name not appropriate, changed it to that of *Saurodon*.

In both species the superior maxillary bone is a trapezoidal plate a little convex externally and concave internally. Its two longer borders are the dental border, and the upper one, which is directed backward and downward, and externally is jagged as if for sutural connexion with other bones. The posterior border is also jagged, yet it is too imperfect in the specimens to judge accurately of its natural condition. The anterior border is longer than that just indicated, and in the specimen of *Saurocephalus Leanus* is united by suture with the premaxillary bone. (Pl. VI. fig. 8, 12 a.)

The number of teeth occupying the maxillary bone of *S. Leanus* (fig. 12 a,) appears to be thirty-six, but in *S. lanciformis*, (fig. 8,) so far as can be judged from the imperfect specimen under consideration, the number appears to have been eight or ten less.

The teeth in the corresponding bone of both species are very nearly alike in form; and they have the same mode of insertion and order of succession as in the existing *Sphyræna*. The crown or exerted portion of the tooth, with a thin enameloid investment, is compressed conical, with trenchant borders and an acute summit. The transverse section near the base is carinated at the poles, convex externally, and trilateral internally. In *S. lanciformis* the crown is straight; its breadth equal to its length, and the thickness half the extent of the breadth; and the trenchant borders are finely denticulate. In *S. Leanus* the crown is slightly curved inwardly; its length is a third greater than the breadth; and the trenchant borders are entire, and extend more upon the fang than in the former. The fang is from two to three times the length of the crown, and tapers towards its free extremity. Internally it is convex, and externally trilateral with the intermediate face grooved, which condition often extends upon the corresponding face of the crown as represented in the enlarged figure 15.

The surface of the crown is striate, but so very minutely that the elevation of the striæ is hardly perceptible. This condition is distinct from the more visible structural folding in the enameloid substance.

In the maxilla of *S. lanciformis* a layer of coarsely granular ossific substance, which invested its outer surface, accumulates at the dental border and envelopes the base of the teeth, and on the inner side of the jaw is defined by a groove containing a series of foramina communicating with the cavities of the successional teeth. In *S. Leanus* a similar layer invests the outer face of the jaw, but does not accumulate at the dental border, where it ceases abruptly. In this species on the inner side of the dental border, vertical notches exist opposite the teeth, terminating below in foramina communicating with the reserved cavities for the successional teeth, as seen in fig. 13.

In the specimen of *S. Leanus* the premaxillary is a quadrate curved bone united by suture with the anterior border of the maxillary, and turned inward at the border where it joins the corresponding bone of the opposite side. Its dental border appears to have supported ten teeth, of which those posterior are of the same size and form as those of the maxillary bones, and the anterior ones, though broken away, judging from the remains of their alveoli, appear also to have been of the same size. The contiguous parts of the premaxillary and maxillary bones at their upper part support a tubercle with a smooth surface, as in fishes ordinarily. (Fig. 12, a, b.)

In the shortness of the premaxillary, its union and continuity with the maxillary, and the support of teeth by the latter, we have an extraordinary variation from the condition of things as existing in the living *Sphyræna*; and indeed the two bones in their form, relative position, union, and continuity of the dental borders, exhibit a striking resemblance to the same parts in the lacertian reptiles.

The lower jaw of *Saurocephalus*, as indicated in the specimen of *S. Leanus*, preserves much more the form and general appearance of that of *Sphyræna* than the upper one. The dental bone has nearly the same outline of form as in the latter, but it is deeper in relation with its length, and is less convex externally. Its symphysis presents very much the appearance of that of *Sphyræna*, though I am not satisfied that the comparatively feeble tubercle antero-internal to the dental border supported a large tooth as in this genus, and of which I can detect no trace. The articular bone holds the same relative position as in *Sphyræna*; as does also its articular process, which is however much more vertical in its direction. (Fig. 14.)

The dental border of the lower jaw appears to have supported about forty-two teeth, which have nearly the same size and form as those of the upper jaw, in which respect this genus further strikingly differs from *Sphyræna*. The inner side of the dental border with its notches presents the same appearance as in the upper jaw.

The more uniform size of the teeth in both jaws of *Saurocephalus* approaches the genus more closely to another extinct allied genus, *Sphyrænodus*, than to *Sphyræna*, and indeed I have a suspicion that a careful comparison of the specimens upon which the two former genera were founded may prove them to be identical.

Professor Agassiz has described and represented a number of isolated teeth (Pois. Fos. V. 102, pl. 25, c. figs. 21—29,) of a large sphyrænoid fish, from the chalk of Lewes, England, which he erroneously refers to the *Saurocephalus lanciformis*, Harlan. Although teeth of the size of those in the fragment of an upper jaw, described by Dr. Harlan, might be inferred from the examination of the *Sphyræna barricuda*, to be accompanied with teeth in the lower jaw, as large as those attributed to *S. lanciformis* by Agassiz, yet the jaws of *Saurocephalus Leanus*, prove this not to be the case.

The crowns of the teeth of *S. lanciformis*, Harlan, are almost as broad as they are long, and do not measure more than  $2\frac{1}{2}$  lines, whereas the corresponding portions of the teeth referred by Agassiz to this species, as represented in his figures, measure from 5 to 15 lines long, and from  $2\frac{1}{2}$  to 6 lines broad.

Dixon, in his Geology of Sussex, following Agassiz, refers portions of the lower jaw and teeth of a large sphyrænoid fish (pl. xxx. fig. 21; xxxi. figs. 12; xxxiv. fig. 11,) apparently the same as that indicated by the figures of Agassiz above noticed, also erroneously to the *Saurocephalus lanciformis*. In a note to page 375 of the same work, he further attributes the rostrum of a Xiphioid fish (pl. xxxii.\* figs. 1) to *S. lanciformis*, to which it certainly does not belong.

Professor Owen's sectional view of the structure of the teeth of *Saurocephalus* (Odonto-

graphy, pl. 55,) was taken from a specimen obtained from Dr. Harlan, and is therefore correct as regards the genus to which it is referred.

Count Münster has described and figured remains, which he refers to three different species of *Saurocephalus* (Giebel, Fauna der Vorwelt, 88,) but to his work I have not had access, and cannot therefore know whether he is correct or not.

Reuss (Verst. d. Böhm. Kreideform. 13, pl. iv. fig. 67) has described an isolated tooth of a fish, which he attributes to the *Saurocephalus lanciformis*, but it does not belong to this, and I think it doubtful even whether it belongs to the same fish supposed to be that species by Agassiz.

Gervais (Zool. e. Palæont. Franc. pl. 70, figs. 5—7,) has represented several large teeth which he attributes to the *Saurocephalus* of Harlan, but these belong to the fish supposed to be of that genus by Agassiz.

To *Saurodon Leanus* Hays, Agassiz has erroneously referred the fragment of a palate bone with teeth (Pois. Foss. v. 102, pl. 25 c. figs. 30, 31) of another large sphyrænoid fish from the chalk of Lewes, England. Though the true *Saurocephalus* may have had semi-barbed teeth to the palate bone, like those just referred to in the fragment described by Agassiz, yet this could not fairly be inferred from the condition of the living *Sphyræna*.

Dixon has noticed and represented (Geol. Sussex, 373, pl. xxx. figs. 28, 29; xxxii.\* fig. 10) several large, isolated, semi-barbed teeth, and a lower jaw and palate bone with teeth, which following Agassiz, have been referred to *Saurodon Leanus*, Hays, to which they certainly cannot belong. The teeth in the lower jaw just mentioned, resemble in form and size those attributed to *Saurocephalus striatus* (Agassiz, Pois. Foss. v. 102, pl. 25 c. figs. 17, 20; Dixon, Geol. Sussex, 375, pl. xxxv. figs. 5,) and a careful examination of the specimens may prove the remains referred by Agassiz and Dixon to the latter and to *Saurodon Leanus* to belong to the same species of fish, though not the *Saurodon Leanus* described by Dr. Hays.

In concluding the above remarks, I have prepared the following corrected list of the fishes which have been attributed to the *Saurocephalus* of Harlan.

1. SAUROCEPHALUS LANCIFORMIS, HARLAN.

Jour. Acad. Nat. Sci. iii. 337, pl. xii. figs. 1—5; Med. a. Phys. Res. 362, pl. figs. 1—5; Trans. Geol. Soc. i. 87; Owen: Odontography, 130, pl. 55.

*Saurodon lanciformis* Hays: Trans. Phil. Soc. iii. 476, pl. xvi. fig. 11.

2. SAUROCEPHALUS LEANUS, HARLAN.

*Saurodon Leanus* Hays: Trans. Am. Phil. Soc. iii. 477, pl. xvi. figs. 1—10.

*Saurocephalus Leanus* Harlan: Trans. Geol. Soc. i. 87.

## 3. PROTOSPHYRAENA FEROX, LEIDY.

*Saurocephalus lanciformis* Harlan, Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 21—29; Dixon: Geol. Sussex, 374, pl. xxx. fig. 21, xxxi. 12, xxxiv. 11; Pictet: Traité d. Palæont. pl. xxxii. figs. 7; Giebel: Odontog. pl. xliii. fig. 7; Reuss: Verst. Böhm. Kreidef. 13, pl. iv. fig. 67?

*Tooth of an unknown fish, and tooth of a species of Squalus*, Mantell: Geol. Sussex, 227, 228, pl. xxxiii. figs. 7, 9.

*Saurocephalus* Harlan, Gervais: Pal. Franc. pl. 70, figs. 5—7?

## 4. PROTOSPHYRAENA STRIATA, LEIDY.

*Saurocephalus striatus* Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 17—20; Dixon: Geol. Sussex, 375, pl. xxxv. figs. 5.

## 5. CIMOLICHTHYS LEVESIENSIS, LEIDY.

*Saurodon Leanus* Hays, Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 30, 31; Dixon: Geol. Sussex, 373, pl. xxx. figs. 28, 29, xxxii.\* fig. 10; Pictet: Tr. d. Pal. pl. xxxii. fig. 6.

(?) *Saurocephalus striatus* Agassiz.

## 6. XIPHIAS DIXONI, LEIDY.

*Saurocephalus lanciformis* Harlan, Dixon: Geol. Sussex, note to p. 375, pl. xxxii.\* figs. 1.

Plate VI. fig. 8. Greater portion of the left superior maxilla of *Saurocephalus lanciformis* Harlan, natural size.

Fig. 9. One of the teeth, magnified three diameters.

Fig. 10. Section of the crown at base, magnified three diameters.

Fig. 11. Section of the fang, magnified.

Fig. 12. Left maxillary (a,) and pre-maxillary (b,) of *Saurocephalus Leanus* Harlan, natural size.

Fig. 13. Internal view of the same specimen.

Fig. 14. Left ramus of the lower jaw of *S. Leanus*.

Fig. 15. Upper tooth, magnified four diameters.